National Aeronautics and Space Administration

GRADES 5-12

Careers in Aeronautics

Aeronautics Research Mission Directorate

Museum in a BOX Series

www.nasa.gov

Careers in Aeronautics

Lesson Overview

This lesson is designed to increase a students' awareness of aeronautics-based career options by introducing them to several professions in this field. The students will explore their own strengths, weaknesses and interests and then determine what role may best suit them, should they decide to pursue a career in aviation.

Objectives

Students will:

1. Assess their talents and skills by performing a mock interview with a fellow class member.
2. Gain a better appreciation for the aeronautical career fields available to them.

GRADES **5-12** **Time Requirements:** 4 hours 40 Minutes

Background

Selecting a Career


(Photo courtesy of the U.S. Department of Defense)

As students explore career choices, they should be encouraged to complete high school with a well-rounded education that encompasses as many math and science-based courses as possible, in order to graduate with the most career path options. Students will also need to develop clear speaking and writing skills to be competitive in the work force. By strengthening these important work skills, students can go on to discover their interests in particular work tasks or professions uninhibited.

Deciding on an employment area, career or industry is a difficult task even for adults. Interest guide questionnaires, available at both school guidance offices and online, can be helpful in the career exploration process. These guides provide a series of questions that gauge the student's interest level for a particular task. Based on their responses, students are presented with the career areas that fit their interests, as well as the occupations associated with those career areas. This will help the students to find jobs and careers that are best suited to those preferences.


(Photo courtesy of NASA www.nasaimages.org)

Because keeping a flexible outlook is critical to one's survival in the workforce, most adults choose career paths that can adjust with the changing economy. The variety of different career paths that an individual can follow in the aeronautics field provides that flexibility.

Several careers in the field of aeronautics require high educational levels, such as a doctorate in engineering, physics, or another physical science. For these careers, students should anticipate a minimum of seven years of college, with two or three degrees earned on their path to success. Other aeronautics careers require specialized training and, while rare, sometimes even result in greater earnings than careers requiring a college degree. The choice between advanced college education and training depends on the student's interests and career goals.

Activity 1 Student Skills and Interest Matching

GRADES **5-12**

Time Requirement: 40 Minutes

Materials:

In the Box

None

Provided by User

None

Worksheets

Skills Assessment (Worksheet 1)

Reference Materials

None

Key Terms:

Aeronautics

Objective:

Students will assess their talents and skills by performing a mock interview with a fellow class member.


(Photo courtesy of the U.S. Department of Defense)

Activity Overview:

Students will conduct simulated job interviews to identify their strengths, weaknesses and interests, and then determine if there are any aeronautical careers that would be a good match for them.

Activity:

1. **As a group, ask students the following question: What is aeronautics?**
   Through discussion, it should be ascertained that aeronautics is an all-encompassing term that describes the design and production, operation, support and servicing of all types of aircraft. It includes everything from the mechanic who repairs them, the pilots who fly them and the controller keeping them apart.

2. **Again as a group, ask the students to raise their hand in response to the following questions:**
   How many of you are really good at:
   a. Math?
   b. Science?
   c. Using a computer?
   d. Building things?
   e. History?
   Using the Background information as necessary, explain to the students that understanding their own personal strengths and weaknesses is vital in determining what career path they should follow.

3. **Distribute one copy of the Skills Assessment Worksheet to each student.** Next, ask the students to sit with a partner or arrange them in pairs. While students will always partner based on familiarity, encourage them to partner with someone they do not know well. *As well as increasing productivity, pairing students with unfamiliar people will give them experience in talking to strangers about themselves; something they will experience in a real job interview.*

(Photo courtesy of NASA www.nasaimages.org)

4. **Have the students write their name and the date at the top of the worksheet and then exchange them with their partners.**

5. **Using the questions on the worksheet, have the students take turns interviewing each other, writing the interviewee's answers on the worksheet.**


(Photo courtesy of NASA - www.nasaimages.org)

6. **When both students in the pair are finished, have them exchange papers and review the answers written.** This will ensure that not only did the interviewer correctly interpret the answers, but that the interviewee answered them clearly.

7. **Once the students have determined their interests and personal strengths are accurate, have them brainstorm to determine potential aeronautical careers that match.**
   This can be done individually or in pairs.


(Photo courtesy of the U.S. Department of Defense)

8. **As a group, review and compare some of the students' answers and discuss which careers might be well-suited for various skillsets.**

NATIONAL SCIENCE STANDARDS 5-8

SCIENCE AS INQUIRY

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

PHYSICAL SCIENCE

- Properties and changes of properties in matter

SCIENCE AND TECHNOLOGY

- Abilities of technological design
- Understanding about science and technology

NATIONAL SCIENCE STANDARDS 9-12

SCIENCE AS INQUIRY

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

PHYSICAL SCIENCE

- Structure and properties of matter
- Interactions of energy and matter

SCIENCE AND TECHNOLOGY

- Abilities of technological design
- Understanding about science and technology

Activity 2 Aeronautics Career Fair

GRADES 5-12

Time Requirement: 4 hours

Materials:

In the Box

None

Provided by User

None

Worksheets

Skills Assessment (Worksheet 1)

Reference Materials

Educational Topics

Key Terms:

Aeronautics

Objective:

In this activity, students will gain a better understanding of the aeronautical careers available to them.

Activity Overview:

Students will explore several careers available to them using the research materials provided. If possible, students should also meet adults currently working in those careers to answer their questions. This will assist each student in selecting the most appropriate career to pursue

Activity:

Prior to beginning the lesson, print all of the Educational Topics in the Reference Materials section and display them as appropriate in the classroom.

1. **If the students haven't already done so, begin by performing Activity 1 - Student Skills and Interest Matching.** This activity will assist the students in understanding their strengths and weaknesses.

2. **Hold up one of the Educational Topics and explain to the students how to correctly use the sheet.**

   a. Start by looking at the "Interests / Abilities" column on the left and answering the questions it poses.

   b. If the students answer Yes to those questions, move to the "Suggested School Subjects / Courses" column and ask yourself "Am I good at these classes?"

c. If the students answer Yes to that question, read the rest of the sheet and determine if that job might be a good fit.

d. If the students answer No to any of the questions, that may indicate that this is not the best topic for their career.

3. **Optional: If possible, have adults who currently work in the aeronautics industry available to answer questions the students may have.** Students' parents, friends and other educators make great resources to help students set their career goals.

4. **Optional: If available, have the students research their selected career further on the Internet.**

5. **Finally, have the students record their chosen career path on their worksheet from Activity 1 for future reference.**

NATIONAL SCIENCE STANDARDS 5-8

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NATIONAL SCIENCE STANDARDS 9-12

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SCIENCE AND TECHNOLOGY

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Reference Materials

Glossary

Aeronautics:
From the Greek words meaning “Navigation of the Air”, it is the term given to describe the science of flight. This includes the study, design and manufacture of any machine with flight capability, or anything associated to its flight.

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-107-ARC

Educational Topic

Aerospace Engineer

Related Job Titles:

Fluid Dynamicist, Mechanical Engineer

Job Description:

Aerospace engineers design, develop, test and oversee the building of aircraft, spacecraft, propulsion systems and space flight mission paths. When designing a new product, engineers first figure out what it needs to do. Then they design and test the parts, fit the parts together and test to see how successful it is. They also write reports on the product. Most engineers work in office buildings or laboratories. Some work outdoors at construction sites. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Do you like to take things apart and put them back together?

Suggested School Subjects / Courses:

- Mathematics (trigonometry, calculus)
- Science (physics, chemistry)
- Computer programming
- Engineering (fluid dynamics, aerodynamics, thermodynamics, propulsion dynamics, mechanical)

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in aerospace engineering or a related subject from an accredited college or university. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Aerodynamics:* design aerospace craft with the best air flow
- *Structures:* design and build new constructions such as a space station
- *Propulsion:* design and develop systems that drive or propel an aerospace craft
- *Astrodynamics:* design spacecraft that can move and function in a space environment

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-138-ARC

Educational Topic

Atmospheric Chemist

Related Job Titles:

Atmospheric Scientist, Environmental Scientist, Air Quality Analyst, Meteorologist, Atmospheric Physicist

Job Description:

Atmospheric chemistry is a multi-disciplinary field that is a sub-set in the broader field of atmospheric science. Atmospheric Chemists are interested in the chemical composition of the atmosphere and how the chemical constituents of the atmosphere interact with each other. Atmospheric Chemists make oberservations and collect data to understand how the atmosphere reacts and changes to sunlight and many parts of the Earth's surface including soils, vegetation, oceans, ice and snow. Some Atmospheric Chemists analyze the composition of our current atmoshere to compare with past data to understand the local, regional, and global impacts of our industrial practices. Atmospheric Chemists can also help gain an understanding of a distant planet's composition because they can analyze the chemistry of a planet's atmosphere remotely.

Interests / Abilities:

- Are you interested in the world around you and the processes that effect our planet?
- Can you perform calculations quickly with great accuracy?
- Are you patient when it comes to completing forms requiring detailed information?
- Do you like to solve logic puzzles?
- Are you a good problem solver?

Suggested School Subjects / Courses:

- Chemistry
- Math (algebra, trigonometry)
- Physics
- Meteorology
- Statistics
- Computer modeling
- Environmental studies
- Electronics

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Atmospheric Sciences or Chemistry from an accredited college or university. Experience in hands-on laboratory techniques is extremely helpful for this job. To do research, at minimum a master's degree is required, and a Ph.D. is highly desired for this position.

Areas of expertise:

- *Synoptic:* analyze data from satellites, radar, and surface-observing instruments
- *Research:* study atmospheric chemistry, refine theories and improve mathematical/computer models of atmospheric composition and its impacts on the planet
- *Environmental:* monitor pollution from traffic and industry and its effects on the planet

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-103-ARC

Educational Topic

Biologist

Related Job Titles:

Life Scientist, Medical Scientist, Biomedical Engineer, Biological Scientist, Psychologist

Job Description:

Biologists study living things and their relationship to their environment. Most biologists work in research and development. Some work on basic research to learn more about living things such as bacteria and viruses. Some work on applied research, which uses research to come up with new medicines, ways to make plants grow better or ways to protect the environment. At NASA, Biologists often research how space environments affect living things, how to support life in space and how life began and changed over time. Some Biologists spend time writing proposals to ask for funding for their research. They usually work regular hours in laboratories and use microscopes, computers and other equipment. Some use plants and animals for experiments. Many do research outside, and many work with a team.

Interests / Abilities:

- Do you enjoy science?
- Do you enjoy doing experiments?
- Are you interested in how animals and plants function?
- Do you work well on your own?
- Do you work well with a team?
- Do you enjoy solving mysteries or problems?

Suggested School Subjects / Courses:

- Biology
- Chemistry
- Physics
- Biochemistry with laboratory research and fieldwork
- Math

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Biology or other appropriate field of Life Science from an accredited college or university. This course of study must include at least 20 semester hours of Physical Science, Engineering or experience that leads to the understanding of the equipment used for manned aerospace flights. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Chemical and biological evolution:* study what life is, where it's located and how it began and changed over time
- *Life support:* research, develop and test life support equipment for aerospace flight
- *Microbiology:* study animals or plants so small, they can only be seen through a microscope
- *Biochemistry:* study the chemicals that living things are made of
- *Physiology:* study how plants and animals function including growth, reproduction, photosynthesis, respiration, movement and how these are affected by space environments
- *Neurobiology:* study the nervous system of living things and how it is affected by space environments

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-140-ARC

Educational Topic

Botanist

Related Job Titles:

Biologist, Life Scientist, Biochemist, Ecologist, Agricultural Scientist, Environmental Scientist, Paleontologist

Job Description:

Botanists study plants and their environment. Some study all aspects of plant life, others specialize in areas such as identification and classification of plants, the structure and function of plant parts, the biochemistry of plant processes, the causes and cures of plant diseases and the geological record of plants. Botanists work in a variety of environments both indoors and out. Good physical condition may be required to reach some remote areas where botanists collect plant samples to bring back to the laboratory for further testing. Others work solely in traditional, indoor environments such as laboratories, offices, museums, botanical gardens, or universities where they conduct research and a variety of experiments, write and publish papers, or teach. Many botanists strike a balance between indoor and outdoor environments.

Interests / Abilities:

- Do you like to examine things under a microscope?
- Are you good at observing and then reporting what you see?
- Do you like hiking or being out in nature?
- Can you clearly communicate your ideas to others?
- Are you good at organizing and classifying things?
- Are you curious about how living things function?

Suggested School Subjects / Courses:

- Biology
- Chemistry
- Mathematics
- Environmental studies
- Laboratory research and fieldwork
- Writing and Speech

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Biology, Biochemistry, Agriculture, Horticulture or related field from an accredited college or university. A bachelor's degree in Botany will generally qualify you for a laboratory technician or technical assistant. A master's degree is required for applied research and managerial positions. A Ph.D. degree is usually necessary for independent research.

Areas of expertise:

- *Taxonomy:* identify and classify plants according to their presumed natural relationship
- *Agriculture:* manipulate genetics to breed crops or prevent disease
- *Pharmaceutical:* study of molecular structure and chemistry of plants and plant extracts to design new medicines
- *Paleobotany:* identify plant fossils or relics in rocks to help identify a geologic age or history of an area
- *Physiology:* study how plants function, including growth, reproduction, photosynthesis, respiration, and movement

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Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-108-ARC

Educational Topic

Chemical Engineer

Related Job Titles:

Organic Chemist, Polymer Chemist, Thermodynamicist, Fluid Dynamicist, Materials Engineer

Job Description:

Chemical Engineers use chemistry, engineering and physics to develop chemical products such as propulsion gases. When designing a new product, engineers first figure out what it needs to do. They then design and test the product. They also write reports on the product. Most Chemical Engineers work in office buildings or laboratories. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Are you creative?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Are you good at working with a team?

Suggested School Subjects / Courses:

- Mathematics (algebra, geometry, trigonometry, pre-calculus, calculus)
- Science (physics, biology, chemistry)
- Engineering (thermodynamics, fluid mechanics)
- Computer programming
- English (writing)

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Chemical Engineering or a related subject from an accredited college or university. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Manufacturing:* design and update machines such as airplanes, robots, cars, etc.
- *Fluids:* design and build fluid flow systems or processes such as pipes
- *Biomedical:* design and develop instruments, such as a heart pump, for medical use
- *Systems:* design and analyze mechanical or heating systems

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-109-ARC

Educational Topic

Computer Engineer

Related Job Titles:

Computer Hardware Engineer, Electronics Engineer, Computer Scientist

Job Description:

Computer Engineers design and develop computers or robots. When designing a new product, engineers first figure out what it needs to do. They then design and test the parts, fit the parts together, and test to see how successful it is. They also write reports on the product. Most engineers work in office buildings or laboratories. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Are you creative?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Are you good at working with a team?

Suggested School Subjects / Courses:

- Mathematics
- Science (physics)
- Engineering (computer electronics, electrical, mechanical, systems engineering)
- Computers programming
- Social studies (history)
- English (writing)

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Computer Engineering or a related subject from an accredited college or university. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Computer hardware:* design and develop computer equipment
- *Robotics:* design and develop robots

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Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-104-ARC

Educational Topic

Computer Scientist

Related Job Titles:

Systems Analyst, Computer Engineer, Software Engineer, Software Developer, Database Administrator, Computer Support Specialist, Network Engineer, Hardware Engineer, Network Administrator, Systems Administrator, Database Specialist, Communications Specialist

Job Description:

Computer Scientists design and develop new computer hardware and software. They research and form new computer rules. They also invent new products such as robots that use virtual reality, new computer languages, programming tools or even computer games. They normally work in offices or laboratories and spend most of their time on the computer.

Interests / Abilities:

- Do you enjoy working with math and technology?
- Are you good at math?
- Are you good at reasoning and logic?
- Do you like to solve problems?
- Do you work well with a team?
- Do you pay close attention to details?
- Do you express yourself well when speaking to others?

Suggested School Subjects / Courses:

- Math
- Science (physics)
- Computer programming
- Electronics

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Computer Science, Computer Engineering, Electrical Engineering, Information Science, Computer Information Systems, Data Processing or a similar subject from an accredited college or university. This study must include 30 semester hours of Differential and Integral Calculus, Statistical Techniques and Computer Science Theory and Practical Applications. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Computer engineering:* use math and science to design hardware, software, networks and processes to solve technical problems such as analyzing flight systems and aerospace data
- *Applications programming:* design and develop software that controls and automates processes such as flight software
- *Communications:* install, test and solve problems for hardware and software on a network
- *Systems analysis:* use computer technology to solve specific business, scientific or engineering problems
- *Database administration:* design, change, test and manage the security of computer databases
- *Computer Support:* assist and advise computer users with hardware, software and system problems

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-105-ARC

Educational Topic

Computer Specialist

Related Job Titles:

Systems Programmer, Applications Programmer, Computer Programmer, Systems Administrator

Job Description:

Computer Specialists write, test and manage computer programs (detailed instructions for computers). They break down each computer task into a series of steps the computer can follow. They then use a computer language to write these instructions. After writing the program, they test it to make sure the computer follows the steps correctly and they fix any problems they find. Computer programmers work in offices and spend most of their time on the computer.

Interests / Abilities:

- Do you enjoy working with math and technology?
- Are you good at reasoning and logic?
- Do you pay close attention to details?
- Do you keep working at a problem until you find a solution?
- Do you work well under pressure?
- Are you imaginative and creative?
- Do you express yourself well when speaking to others?

Suggested School Subjects / Courses:

- Math
- Science (physics)
- Computer programming

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Computer Science, Information Science, Mathematics, Engineering, Physical Science or a similar subject from an accredited college or university. It is helpful to have experience with computers from internships or summer jobs. Since Computer Science changes quickly, all Computer Programmers must keep their skills up-to-date by seeking training throughout their career.

Areas of expertise:

- *Applications programming:* write software to handle specific jobs in an organization or business
- *Systems programming:* manage the use of computer systems software so that communication on a network works smoothly

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Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-110-ARC

Educational Topic

Electronics Engineer

Related Job Titles:

Electrical Engineer, Computer Engineer, Computer Scientist

Job Description:

Electronics Engineers design, develop, test and lead the production of electrical and electronic equipment including scientific instruments, motors, wiring in buildings, aircraft, radar, computers, robots and video equipment. Most Engineers work in office buildings or laboratories. Some work outdoors at construction sites. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Do you like to take things apart and put them back together?

Suggested School Subjects / Courses:

- Mathematics (algebra, geometry, trigonometry, calculus)
- Science (physics, biology, chemistry)
- Computers
- Engineering (thermodynamics, fluid dynamics, mechanical, electronics)

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Electrical or Electronics Engineering from an accredited college or university. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Sensors and transducers:* research and develop sensing devices such as lasers that are needed in aerospace research
- *Electronic instrumentation:* research and develop equipment that can detect, record and measure data for aerospace research
- *Guidance and navigation systems:* research and develop systems used to guide and navigate aerospace vehicles and spacecraft
- *Electromagnetic systems:* research and develop instruments, such as antenna systems, that measure electromagnetics
- *Tracking and telemetry systems:* research and develop systems and devices that track the flight of aerospace vehicles or that transmit and receive data and commands between space vehicles and the ground
- *Computer design:* design and develop computers or robots

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-106-ARC

Educational Topic

Engineer

Related Job Titles:

Electrical Engineer, Electronics Engineer, Mechanical Engineer, Aerospace Engineer, Chemical Engineer, Materials Engineer, Computer Engineer

Job Description:

Engineers design, develop and test products, machinery, factories and systems such as buildings, robots, instruments, spacecraft, airplanes, motors and other equipment. When designing a new product, Engineers first figure out what it needs to do. They then design and test the parts, fit the parts together and test to see how successful it is. They also write reports on the product. Most Engineers work in office buildings or laboratories. Some work outdoors at construction sites. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Do you like to take things apart and put them back together?

Suggested School Subjects / Courses:

- Mathematics (algebra, geometry, trigonometry, calculus)
- Science (physics, biology, chemistry,)
- English (writing)
- Social studies (history)
- Computer programming
- Engineering

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Engineering from an accredited college or university. Engineering degrees are generally offered in Electrical, Mechanical, Aerospace or Civil Engineering. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Electronics:* design and lead the production of electrical and electronic equipment such as motors, wiring, aircraft, radar and computers
- *Aerospace:* design, test and lead the building of missile, spacecraft and aircraft
- *Chemistry:* use chemistry and engineering to solve problems in producing or using chemicals and to design equipment for producing chemicals
- *Mechanics:* plan and design tools, engines, machines and other equipment such as jet and rocket engines and robots
- *Computers:* design and develop computers or robots
- *Materials:* develop and test new types of materials for aerospace systems and vehicles

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-111-ARC

Educational Topic

Engineering Technician

Related Job Titles:

Physical Science Technician, Data Technician, Engineering Aid, Aerospace Engineering Technician, Architecture Technician, Biomedical Technician, Chemical Engineering Technician, Civil Engineering Technician, Electrical Engineering Technician, Materials Engineering Technician

Job Description:

Engineering Technicians use science, math and engineering to solve technical problems. Most assist engineers and scientists by setting up or installing equipment, testing, maintaining and repairing equipment, conducting experiments, recording results, writing design plans and running tests. Engineering Technicians also gather data from various sources such as field notes, design books and lab reports. They look at the data and report any errors or data that do not fit with the rest. Engineering Technicians usually work in a laboratory, office or construction site. They spend a lot of time on the computer recording data, writing reports and writing design plans.

Interests / Abilities:

- Do you enjoy math and science?
- Are you good at math?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Are you good at working with a team?
- Do you express yourself well when writing?

Suggested School Subjects / Courses:

- Mathematics (algebra, trigonometry)
- Science
- Computers
- Technical drawing/drafting

Education / Training Needed:

At least two years of specialized training in Computer Hardware or Engineering Technology is required. This training may be earned at an institute, vocational school, community or junior college, or from work experience. It is helpful to have some experience from internships or summer jobs in laboratories.

Areas of expertise:

- *Electronics:* help design and lead the production of electrical and electronic equipment such as radar, sonar, navigation equipment and other instruments
- *Engineering drafting:* use graphics to show designs of products before they are built
- *Construction:* oversee the construction or repair of structures or facilities
- *Cartography:* create and edit maps and charts
- *Equipment:* test and maintain equipment

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-114-ARC

Educational Topic

Executive Manager

Related Job Titles:

Director, Administrator, Deputy, Chief

Job Description:

Executive Managers are the top leaders of a business or organization. At NASA, an Executive Manager is the leader of a NASA center or a program office who sets the center or program goals and makes an action plan to lead activities, research, programs and missions. Most work long hours and are required to travel often to other NASA centers and conferences. They may speak or appear at public events.

Interests / Abilities:

- Are you confident?
- Are you good at making decisions?
- Do you have a lot of energy?
- Are you good at leading and persuading people?
- Do you express yourself clearly when speaking?
- Do you work well under pressure?
- Do you work at your goals until you succeed?
- Are you good at solving conflicts in a positive way?

Suggested School Subjects / Courses:

- Science
- Engineering
- Management
- Public speaking

Education / Training Needed:

The minimum education required for this position is a bachelor's degree from an accredited college or university. The qualifications sought in an Executive Manager include leadership skills in leading change, leading people, producing results, managing resources, communicating and building cooperation with others. Most Managers begin as a scientist or engineer and are promoted to a management position because of their leadership skills and their broad understanding of science.

Areas of expertise:

- *Center direction:* lead one of NASA's twelve centers.
- *Program office direction:* lead a large program such as Space Science.

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Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-122-ARC

Educational Topic

Human Factors Researcher

Related Job Titles:

Research Psychologist, Research Associate, Human Performance Researcher, Human Physiology Researcher

Job Description:

This type of work within aviation ranges from studying pilots in the cockpit as they relate to the cockpit controls all the way to studying sleep physiology in order to improve safety for pilots during flight operations of long duration. A Human Factors Researcher uses the scientific method to develop a hypothesis and set up an experiment to test the theory. After lengthy and repeated trials, the results would be presented and enacted in a trial of the new methodology being suggested by the study. The researcher would have to be able to develop and perform scientifically-based experiments and document the results. Such studies might occur over a long period of time, other studies might cover a few weeks or days with others lasting no more than an hour. The researcher must be a keen observer with excellent note taking skills as well as fine writing skills with which to develop detailed reports.

Interests / Abilities:

- Do you like to take things apart and see how they work?
- Are you fascinated with the human body and how it works? Would you be interested to see how it operates especially in extreme or unusual situations?
- Would finding a better way to make a machine or assembly line work more efficiently be a fun challenge?
- Do you enjoy studying people and how they interact with machines?

Suggested School Subjects / Courses:

- Mathematics: Algebra and Statistics
- Psychology
- Sociology (the study of human relationships)
- Physiology (the study of body systems and their interactions)
- Kinesiology (the study of human movement and mechanics)
- Biology

Education / Training Needed:

To perform the lab work would require a bachelor's degree from an accredited college or university in the field(s) of Biology, Psychology or Physiology. To oversee some research projects would require a master's degree in a complimentary subject. To manage a research program would require a Ph. D. Depending upon what specialty you go into, a license might be required which would mean you have to take a licensing exam.

Areas of expertise:

- *Behavioral Sciences, Psychology, Clinical Psychology, Physiological Psychology*
- *Biology, Biophysics, Physiology, Kinesiology*
- *Human/system integration technology*

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-112-ARC

Educational Topic

Materials Engineer

Related Job Titles:

Metallurgical Engineer, Ceramics Engineer

Job Description:

A Materials Engineer develops and tests new types of metallic and non-metallic materials (ceramics, plastics, and composites) for use in aerospace systems and vehicles. When making a new material, Materials Engineers select materials with the structure and features needed for a given purpose. For example, they might develop lightweight, strong, heat-resistant materials for use in space. Most Materials Engineers work in laboratories. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Are you creative?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Are you good at working with a team?
- Do you express yourself well when speaking and writing?

Suggested School Subjects / Courses:

- Mathematics
- Physics
- Chemistry
- Engineering (materials)

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Materials Engineering or a related subject from an accredited college or university. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Ceramics:* develop new ceramic materials
- *Metallurgy:* study and develop new metals by combining different metals

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-116-ARC

Educational Topic

Mathematician

Related Job Titles:

Computer Scientist, Computer Programmer

Job Description:

There are two types of Mathematicians: theoretical and applied. Theoretical Mathematicians come up with new mathematical rules and processes using the latest technology. Applied Mathematicians use math rules and processes to solve scientific, engineering and business problems. These problems might include studying and designing computer models that help to create faster and higher aerospace vehicles and systems. Mathematicians usually work in an office and spend a lot of time on the computer.

Interests / Abilities:

- Do you enjoy working with math and technology?
- Are you good at math?
- Are you good at reasoning and logic?
- Do you like to solve problems?
- Do you work well with a team?
- Do you keep working at a problem until you find a solution?

Suggested School Subjects / Courses:

- Math (algebra, geometry, statistics, calculus)
- Computer science (programming)
- Engineering
- Science

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Mathematics from an accredited college or university. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Modeling:* make simulations to study and improve aerospace craft and systems
- *Data analysis:* study aerospace problems and come up with the quickest, easiest method of modeling and solving them
- *Statistician:* design experiments, gather data, decide what the data means, and make predictions

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2002-09-113-ARC

Educational Topic

Mechanical Engineer

Related Job Titles:

Mechanical systems engineer, aerospace engineer, materials engineer

Job Description:

Mechanical **engineers** plan and design engines, machines and other equipment. When designing a new product, **engineers** first figure out what it needs to do. They then design and test the parts, fit the parts together and test to see how successful it is. They also write reports on the product. Most **engineers** work in office buildings or laboratories. Some work outdoors at construction sites. Some must travel to different work sites.

Interests / Abilities:

- Are you good at math?
- Are you creative?
- Is your work detailed?
- Do you like to solve problems?
- Are you interested in how things work?
- Do you like working with computers?
- Are you good at working with a team?

Suggested School Subjects / Courses:

- Mathematics (**algebra**, **geometry**, **trigonometry**, **pre-calculus**, **calculus**)
- Science (**physics**, **biology**, **chemistry**)
- **Engineering** (**thermodynamics**, **fluid mechanics**)
- Computer programming
- Social studies (history)
- English (writing)

Education / Training Needed:

The minimum education required for this position is a **bachelor's degree** in **mechanical engineering** from an accredited **college** or **university**. To do research, a **Ph.D.** is highly desired for this position.

Areas of expertise:

- *Manufacturing*: design and update machines such as airplanes, robots, cars, etc.
- *Fluids*: design and build fluid flow systems or processes such as pipes
- *Biomedical*: design and develop instruments such as a heart pump for medical use
- *Systems*: design and analyze mechanical or **thermal** systems

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-144-ARC

Educational Topic

Microbiologist

Related Job Titles:

Biologist, Life Scientist, Medical Scientist, Molecular Biologist, Biochemist, Physiologist, Ecologist

Job Description:

Microbiologists study living things that are too small to be seen without a microscope, such as bacteria, algae or fungi. They are interested in the effects micro-organisms have on plants, animals and humans (for example, how micro-organisms assist in the breakdown and decomposition of living things). Microbiologists are also interested in the uses micro-organisms may have in the environment and people's daily lives, such as cures for human diseases. Microbiologists often work in traditional environments such as laboratories, offices, work stations or universities where they conduct research and a variety of experiments, write and publish papers, or teach.

Interests / Abilities:

- Do you like to examine things under a microscope?
- Are you good at observing and then reporting what you see?
- Can you clearly communicate your ideas to others?
- Do you like to help other people?
- Are you interested in what causes diseases and how they are spread?

Suggested School Subjects / Courses:

- Biology
- Chemistry
- Mathematics (algebra, trigonometry and calculus)
- Laboratory research and fieldwork
- Writing and speech

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Biology, Microbiology, or related field from an accredited college or university. This level generally does not involve research and generally involves assisting others in testing and observation. A master's degree is required for applied research and managerial positions. A Ph.D. degree is usually necessary for independent research.

Areas of expertise:

- *Bacteria:* study of bacteria and their relations to medicine, industry and agriculture
- *Mycology:* a branch of biology dealing with fungi
- *Viral:* a branch of science that deals with viruses
- *Food/Industrial:* micro-organisms to be used in yogurt,cheese, etc.
- *Environmental:* identify micro-organisms that may pollute food, water and the environment
- *Medical:* identify micro-organisms that can be used in medicines or help identify or treat disease

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-145-ARC

Educational Topic

Molecular Biologist

Related Job Titles:

Biologist, Life Scientist, Medical Scientist, Geneticist, Biochemist, Physiologist

Job Description:

Molecular Biologists study how genes in cells cause biological characteristics and function in organisms. They study the detailed genetic make-up of plants, animals, humans, bacteria, and fungi. They study nucleic acids (DNA and RNA) for medical testing for disease-causing organisms and to test for inherited human genetic disorders. Molecular biologists are also important in industry for developing new lines of plants, animals and micro-organisms, or aid in the development of new medicines. Molecular biologists often work long hours in traditional environments such as laboratories, offices, or universities where they conduct research and a variety of experiments, write and publish papers, or teach.

Interests / Abilities:

- Do you like to examine things under a microscope?
- Are you good at observing and then reporting what you see?
- Can you clearly communicate your ideas to others?
- Do you like to help other people?
- Do you pay attention to details and enjoy working accurately?
- Are you able to concentrate or work continuously for many hours?

Suggested School Subjects / Courses:

- Biology (biochemistry, genetics, microbiology, immunology)
- Chemistry (organic, physical, inorganic)
- Mathematics
- Laboratory research and fieldwork
- Writing and speech

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Biology, Microbiology, Biochemistry, or related field from an accredited college or university. This level general does not involve research and generally involves assisting others in testing and observation. A master's degree is required for applied research and managerial positions. A Ph.D. degree is usually necessary for independent research and several years of research and post-doctoral work are generally required.

Areas of expertise:

- *Genetics:* understand the inheritance of genetic diseases and provide counseling to families
- *Criminology:* provide law enforcement with evidence (such as DNA) to help solve crimes
- *Agriculture:* manipulate genetic makeup to breed new crop plants or livestock
- *Pharmaceutical:* study of molecular structure to design new medicines

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-101-ARC

Educational Topic

Physical Science Technician

Related Job Titles:

Biological Technician, Chemical Technician, Environmental Technician, Engineering Technician

Job Description:

Physical Science Technicians help scientists and engineers with their products and experiments. They set up and run laboratory instruments. When there are problems with the instruments, Physical Science Technicians fix them. They also check and track experiments, make observations of the experiments, record results, and often make conclusions. Physical Science Technicians gather data from various sources such as field notes, design books, and lab reports. They look at the data and report any errors or data that don't fit with the rest. Physical Science Technicians usually work regular hours and, depending on their area of study, may work in a laboratory or outdoors. They spend a lot of time on the computer.

Interests / Abilities:

- Are you good at solving problems?
- Do you like to use computers?
- Do you express yourself well when you speak and write?
- Do you work well with others?
- Do you like to do science experiments?

Suggested School Subjects / Courses:

- Science (with laboratory activities)
- Math
- Computers

Education / Training Needed:

At least two years of specialized training in science or science-related technology is required to be a technician. This training may be earned at a technical institute, vocational school, from a community college or junior college, or from work experience. It is helpful to have some experience from internships or summer jobs in laboratories.

Areas of expertise:

- *Biology:* assist scientists in studying living things, such as viruses, microbes, and DNA
- *Chemistry:* assist scientists to develop, use, and study chemicals
- *Engineering:* assist scientists and engineers with instruments

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-115-ARC

Educational Topic

Project Manager

Related Job Titles:

Project Lead, Technical Lead, Principal Investigator

Job Description:

Project Managers plan, organize, and lead research, development, design, and computer activities. Project Managers lead other people by dividing tasks, making a schedule, reviewing, and assessing their work. They come up with a detailed plan of how to reach the goals of a project and estimate the cost of the project. They present ideas and projects to top management for approval or for funding. Project Managers spend most of their time in an office and in meetings. Sometimes they have pressure to meet deadlines.

Interests / Abilities:

- Do you manage your time well?
- Are you good at making decisions?
- Are you organized?
- Are you good at leading and persuading people?
- Do you get along well with others?
- Do you express yourself clearly when speaking?
- Are you good at inspiring or motivating others?

Suggested School Subjects / Courses:

- Science, engineering or computer science
- Math
- Speech
- Leadership

Education / Training Needed:

To be a Program Manager, experience as an Engineer, Mathematician, Scientist, or Computer Professional is essential to understand and guide the type of work managed. The minimum education required for this position is a bachelor's degree from an accredited college or university. A Program Manager must know NASA's methods and rules of managing projects and gathering resources. Project Managers must also be able to organize many activities happening at one time. Most managers begin as a Scientist or Engineer and are promoted because of their management skills.

Areas of expertise:

- *Engineering:* lead people who design and develop equipment, products, and processes
- *Science:* lead research and development activities in chemistry, biology, geology, meteorology, or physics
- *Computer systems:* lead and plan programming and projects that use computers and coordinate development of computer equipment and software

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-117-ARC

Educational Topic

Psychologist

Related Job Titles:

Cognitive Psychologist, Research Psychologist

Job Description:

Psychologists study the human mind and behavior. They make predictions and collect data to test their predictions through lab experiments, tests, observations, interviews, or questionnaires. They may work at a counseling center, their own office, a hospital, a clinic, university, research center, business, non-profit or government organization. NASA Psychologists are usually Research Psychologists who do research and come up with explanations for how people behave or function in aerospace environments. These studies may include how well humans can use their senses and make decisions, how the environment affects a human's ability to think and work, and how well crew members work together and get along in aerospace conditions. Some travel is usually required to attend conferences or conduct research.

Interests / Abilities:

- Are you a good listener?
- Do you enjoy doing research?
- Do you pay close attention to details?
- Do you work well on your own?
- Do you work well with a team?
- Do you express yourself clearly when speaking and writing?

Suggested School Subjects / Courses:

- Science (biology, psychology)
- Math (statistics)
- Research methods

Education / Training Needed:

The minimum education required for this position is a bachelor's degree in Behavioral Science or other appropriate subject from an accredited college or university. This course of study must include at least 20 semester hours of Physiology, Experimental Physiological Psychology or other appropriate life science or experience in biotechnology, hardware or other appropriate life science field. To do research, a Ph.D. is highly desired for this position.

Areas of expertise:

- *Human performance studies:* study how humans behave and function, how the crew works together, and how the senses work in aerospace environments
- *Manned systems:* design guidelines for hardware and software to best meet human needs in aerospace environments

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2004-10-121-ARC

Educational Topic

Software Engineer

Related Job Titles:

Computer Programmer, Computer Scientist, Systems Analyst, Programmer/Analyst, Quality Assurance Engineer, Technical Writer, Web Designer, Database Administrator

Job Description:

A software engineer writes the software that is used in automated systems. Automated systems help people do their jobs by providing them with information, giving them advice, performing repetitive tasks or in some cases, by controlling actual systems. The computer software contains the instructions that tell the system what to do. The first job of a Software Engineer is to understand the tasks that are going to be automated. Then, a Systems Analyst will decide how the automation system can assist or enhance the performing of those tasks. After that the Software Engineer, usually working in a team, will create programs to perform the functions desired by the users of the system. The Software Engineer will test the system to make sure it works the way it is supposed to work.

Interests / Abilities:

- Do you like logic puzzles and games?
- Can you patiently sit for hours while trying to figure something out?
- Do you enjoy working on a team?
- Is it easy for you to identify the steps it will take to do or make something?
- Do you enjoy building things and seeing them operate?
- Do you think it's fun to "play with numbers" while solving complicated equations?

Suggested School Subjects / Courses:

- Math
- Science
- Statistics
- English
- Computer Programming
- Electronics

Education / Training Needed:

For most programming jobs, a bachelor of arts or science degree is sufficient if in a technical field. For other jobs, a Masters or Doctorate in Computer Science or Electrical Engineering may be required. Some companies will hire people with little education or experience and train them in computer programming. Often times, the ability to learn and to think logically and creatively is more important than formal education or training. The abilities to communicate ideas and to understand others are also important when working as a member of a team, so English and public speaking are valuable skills.

Areas of expertise:

- *Computer programming languages*
- *Operating systems*
- *Application programming*
- *Distributed computing*
- *Networking*
- *Databases*
- *Graphical user interfaces*
- *Statistics*
- *Numerical computing*
- *Real-time computing*

National Aeronautics and Space Administration

Educational Product	
Educators & Students	Grades 5-12

ET-2002-09-120-ARC

Educational Topic

Weather Station Manager

Related Job Titles:

Meteorologist, Weather Officer, Weather Forecaster, Meteorology Researcher, Meteorological Modeling Specialist

Job Description:

As a manager, the primary work deals with supervising the employees (other meteorologists) working in your area. This means dealing with people-related issues and performance evaluation. The meteorologists collect weather data, survey weather indicators and make predictions regarding developing weather patterns. They advise air traffic controllers on weather hazards such as thunderstorms, developing storm cells and fronts, turbulence, icing and other such weather-related phenomena. They issue to controllers weather advisories for aircraft. They use sophisticated computer software programs that assist them in modeling the potential flow and intensity of storm cells and fronts. They are also available to participate in weather-related research projects that seek to improve air traffic management in adverse weather conditions.

Interests / Abilities:

- Do watching weather reports on television interest you?
- Do you notice the slightest change in the sky, the air temperature and the wind?
- Do you enjoy motivating people to work as a team?
- Do you like to motivate people toward self-improvement?
- When you take measurements, are you precise and double check your readings for accuracy?

Suggested School Subjects / Courses:

- Algebra
- Trigonometry
- Physics
- Meteorology
- Statistics
- Computer modeling
- Psychology (to help deal with people)
- Interpersonal communication (to help deal with people)

Education / Training Needed:

A Bachelors of Science and a Masters of Science degree in Meteorology from an accredited college or university is required. Experience in computer modeling techniques is helpful for this position. Management training courses are essential for competent and efficient job performance.

Areas of expertise:

- Meteorology
- Severe storms
- Icing
- turbulence
- Fronts
- Computer modeling software
- Human resources management

Student Worksheets

Worksheet 1 Skills Assessment

Name: _____ **Date:** _____

When you're not in school, name three things you like to do:

1. _____
2. _____
3. _____

What are your three favorite classes?

1. _____
2. _____
3. _____

What are your skills or personal strengths? What are your weaknesses?

_____

_____

_____

What is your greatest accomplishment?

_____

_____

_____

_____

_____

Worksheet 1 Continued

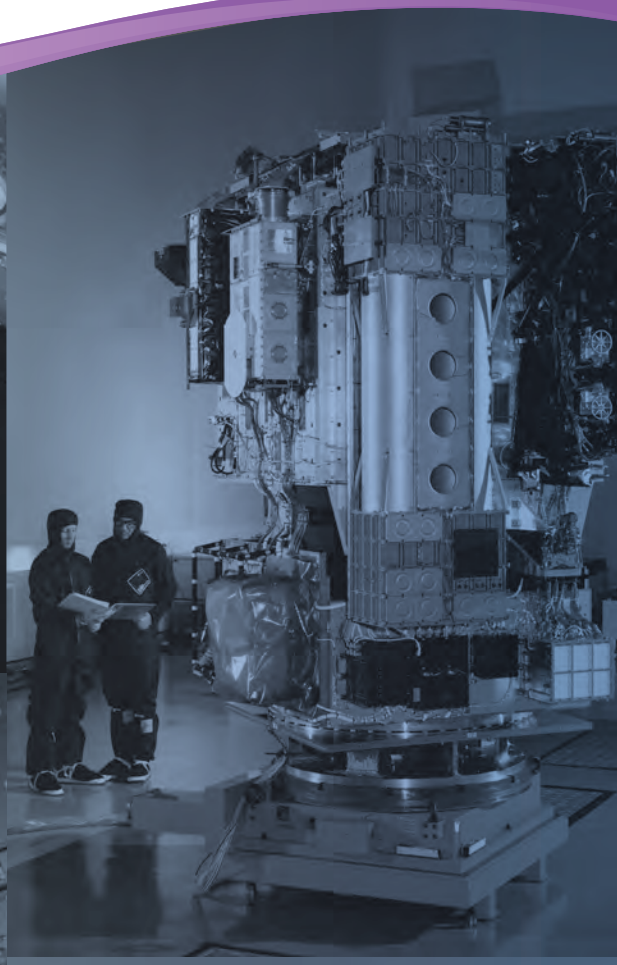
Do you know anyone who works in aeronautics? What do they do?

If so, does that job sound interesting? Why?

Have you considered a career in aeronautics? If so, what career have you considered and why?

Aeronautics
Research
Mission
Directorate

Museum in a BOX Series



careers

EP-2010-12-499-HQ